



Report

The Perfect E-Storm *emerging technology, enormous learner demand, enhanced pedagogy, and erased budgets*

Part 1: Storms #1 and #2

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The Perfect E-Storm: *emerging technology, enormous learner demand, enhanced pedagogy, and erased budgets*

Abstract

Many demands are currently placed on online learning in higher education. While we may not realise it, we have entered the perfect electric storm, where technology, the art of teaching, and the needs of learners are converging. As such, this paper explores dozens of emerging learning technologies that are generating waves of new opportunities in online learning environments. In addition, this manuscript reviews trends in online enrolments, programs, and degrees in colleges and universities in the United States and around the world. To help create engaging content, pedagogical activities are outlined for synchronous and asynchronous learning with estimates of the degree of instructor risk and time as well as technological cost. Such activities focus on experiences that are rich in collaboration, interaction, and motivation. Finally, in the fourth storm, budgetary cutbacks are discussed which are restricting how colleges and universities can respond to these emerging technologies, enormous learner demands, and enhancements in pedagogy. These lean fiscal times are forcing institutions of higher learning to explore innovative projects and partnerships, including open source software solutions. Throughout the document, recent survey data projecting the future of online learning in higher education is presented. Due to its length the Observatory will publish this report in two parts. 'The Perfect E-Storm, Part 1' will include Storm #1 and #2 (published week of June 21, 2004), while 'The Perfect E-Storm, Part 2' will include Storm #3 and #4 and concluding remarks (published week of June 28, 2004). Both parts are published under the same title and include the full set of references at the end of the document.

1 INTRODUCTION

There is a storm brewing. Some have heard the thunder of numerous collaborative and learner-centred online technologies being developed over the past few years. Others have felt the brisk winds coming from another direction; winds brought about by innovative instructors experimenting with online pedagogy that better motivates online learners. Adding to this turbulence, millions of learners are signing up for online courses. Unfortunately, many of them quickly become bored online learners who plead for more rich and engaging online experiences. As these three storms collide, they create the perfect storm linking pedagogy, technology, and learner needs. Now add to that a fourth storm, erased budgets, that stand directly in the way of expensive technology purchases, expanding online programs, and risky instructional initiatives associated with the other three storms.

In the 2000 movie, 'The Perfect Storm,' three storms converge to wreck havoc for boats at sea off the eastern coast of the United States. The movie was a recreation of actual story from October 1991. In the key plot of the movie, Captain Billy Tyne of the Andrea Gail, here played by actor George Clooney, heads out from Gloucester, Massachusetts with five other crew members for prime fishing spots of the North Atlantic to try to make up for slow times. Unfortunately, they get caught in an unusually intense storm pattern that had never previously occurred in recorded history. When ten story high waves and 120 mile winds develop, they are caught off guard and do not return home.

In the "Perfect E-Storm," there actually are four storms, not three. This report lays out the perfect e-storm, with dozens of innovative learning technologies to cloud the online learning landscape (E-Storm #1: Emerging Technology), thousands of learners enrolling in online courses at many universities around the globe (E-Storm #2: Enormous Learner Demand), a plethora of collaborative and interactive techniques to engage online learners in both synchronous and asynchronous environments (E-Storm #3: Enhanced Pedagogy), and extensive cutbacks in budgets for these technologies, learners, and pedagogical ideas (E-Storm #4: Erased Pedagogy).

In terms of the first storm, colleges and universities are faced with difficult decisions about what technologies to select for their e-learning courses and programs as well as how many students to admit. Available tools and options for synchronous and asynchronous learning are overwhelming. Asynchronous tools might include online discussion forums and Web link sharing tools, while synchronous tools often include chat rooms, application sharing, and audio and video streaming. However, online learning success now extends well beyond simply choosing between synchronous and asynchronous courseware technologies. Today there are many other choices including wireless, wearable, adaptive, and mobile technologies.

At the same time that emerging technologies are impacting online learning opportunities, millions of new learners are demanding instructional formats that meet their needs. As shown in this report, institutions of higher learning around the globe are exploding with new online learners, courses, programs, and degrees. In the United States, enrolment spikes since 1999 look extremely similar. Data presented in this report to support the second storm will come from Indiana University, the University of Illinois, the Ohio State University, The State University of New York System, National University in California, and select universities in Finland, Korea, and South Africa. Many colleges and universities around the world, in fact, have been transformed from few, if any, online students in 1998 or 1999 to thousands, if not tens of thousands, of e-learners today. This explosion is now moving from higher education settings to secondary and even primary education (Freedman, Darrow, & Watson, 2002; Web-based Education Commission, 2000).

The third storm is in the area of pedagogy. Unfortunately, most online courses, programs, and resources still lack sufficient interactivity and collaboration needed to effectively engage online learners. Consequently, there is a pressing need for advice on how to create exciting and relevant online materials. In response, this manuscript will clarify many of these pedagogical opportunities for online learning; especially those related to online motivation and engagement.

The fourth storm, eroded budgets, presents considerable financial considerations and barriers that must be addressed or overcome. The present economy, naturally, makes this storm the most monitored in daily online learning weather reports. In fact, many states and nations have significantly reduced, and, in some cases, eliminated their technology budgets. As a result, most higher education administrators are searching for cost reductions in open source, free, and homegrown software solutions. This report discusses two open source course management solutions that are increasingly popular, the Sakai Project and Moodle.

Overall, some educators are excited by this storm system; especially the third storm. In fact, many online instructors are welcoming them in after suffering through a decade of drought-like conditions in the area of online pedagogy. They thirst for online instructional activities which are fresh, innovative, and engaging. Unfortunately, most online learning technologies are designed for the management of learners online, not for online learners to manage their own learning. Too often online courseware provides access to student records or tests, but not rich, interacting learning experiences. Consequently, too often there is no learning in e-learning!

Clearly staying abreast of the latest developments, partnerships, or opportunities in e-learning is a difficult endeavour. In response, this report attempts to provide a framework for doing so. More details of the first storm, emerging technology, are offered in the section below.

2 Emerging Technologies (Storm #1)

The Report of the Commission on Technology and Adult Learning (2001) defined e-learning as "instructional content or learning experiences delivered or enabled by electronic technology." Such a definition is perhaps deliberately broad. Each day institutions of higher education are bombarded with news about unique electronic technologies that can be incorporated in teaching and learning. There

has been such a proliferation of technology during the past decade that it is difficult to fault instructors and students for any reservations or hesitancy in their use. Salomon (1997), in fact, notes that for the first time in modern history, learning technology has advanced well beyond learning theory. Consequently, from an administrative perspective, it is difficult to justify technology purchases and new initiatives. And from a college instructor perspective, there are questions as to how, when, and why to use new learning technology. In addition, it can be overwhelming for a professor to hear about a new technology that should be incorporated when she has already extensively experimented with a number of educational technologies.

Despite the frustrations, various technologies for learning continue to emerge. Some of these are found more in synchronous or real-time environments and other ones in asynchronous. Asynchronous environments are also called delayed or learn anywhere, anytime technologies. The third storm of this paper, enhanced pedagogy, highlights some of the different activities that can be accomplished with asynchronous or synchronous technology in online learning. As will be evident, there are many connections between emerging technologies (i.e., Storm #1) and enhanced pedagogy (i.e., Storm #3). For instance, a survey tool allows instructors to collect online information from students and give them a voice in a class. So an online survey is simultaneously a technology and a pedagogical activity.

Colleges and universities tend to use asynchronous or delayed technologies with an instructor as the basis of e-learning. In contrast, corporate training environments often select asynchronous technologies for self-paced learning and synchronous ones for instructor-led training. Asynchronous tools might include online discussion forums, electronic gradebooks, online exams, Web link sharing tools, student profiles, and course announcement pages. Synchronous presentation tools often include application sharing, Web browsing, audio and video streaming, chat rooms, and surveying and polling.

2.1 Descriptions of 30 Emerging Educational Technologies

In addition to the synchronous and asynchronous tools for online learning, there are dozens of technologies that will soon make a major splash onshore. Thirty emerging technologies for learning are mentioned below in alphabetical order, most of which are already finding uses in online environments. Below them are three online activities that often occur when several of these technologies are combined. Any of the technologies listed below can help transform teaching and learning in higher education. Some of them already are.

1. **Augmented Reality.** Using a technology called augmented reality, the computer (using special glasses) displays objects that look like they are part of the real world. For instance, when standing at an archaeological site, you can walk through the site and see structures that are no longer there. With the special glasses, such structures are virtually displayed alongside real ones that still exist. While not yet prevalent in online environments in higher education, the U.S. military is testing wearable and augmented reality devices for their training needs (Kirkley, 2003). When more fully developed, this technology will likely have a major impact in tertiary education around the globe.
2. **Assistive Technologies.** There are already dozens of technologies that aid those with visual, auditory, speech, physical, and other impairments. Assistive technologies can support students with special needs or circumstances (e.g., enlarged text for visually impaired learners, speech recognition software, and screen readers such as JAWS). Inroads here are critical for all online learners since many technologies designed for students with special needs often impact everyone (e.g., voice recognition software). And as this happens, the costs of such products usually tumble.
3. **Blogs.** "Web logs — blogs for short — are the surprise wedding of the informational capacity of journalism and the speed of instant messaging" (Everts, 2003). Blogs, both public and private, provide a means to create a personal journal or diary. They typically consist of brief and frequent postings arranged in chronological order about a news event, publication, or someone else's blog (Glenn, 2003). Some allow for commenting feedback, embedded media,

and Web link posting. Similar to an online journal or electronic newsletter, blogs provide information on a wide range of topics from emerging laws in Iraq or economic forecasts in Europe to gender imbalance in academic philosophy. Some of the most popular ones garner more than 100,000 hits per day. Blogs serve various purposes including personal news reporting, manuscript feedback, and article reflections. Perseus Development Corporation (2004) reported that there are more than 4 million blogs worldwide, the majority of which have been created by females. This same report indicated that most blogs have been authored by individuals between 13 and 30 years old. A more recent report from the Pew Research Center estimates that there are 2.5 million blogs created in the U.S. by between 2 and 7 percent of adult Internet users (Lenhart, Fallows, & Horrigan, 2004). Even more impressively, Bruner (2004) pointed out that about 10,000 new blogs are added each day in the U.S. alone. The majority of blogs once created, however, do not remain active.

4. **Asynchronous Conferencing or Discussion Forums.** Though no longer an emerging technology, asynchronous or delayed computer conferencing is highly popular in online learning. In fact, it may be the sole tool used in many online learning environments. With asynchronous technologies, learners and instructors can communicate anywhere, anytime about course content or activities occurring in the real world. They may also have weekly forums with guest experts. Article discussions and lecture reflections are a common practice. The time independence of asynchronous Web-based conferencing tools offer learners opportunities to evaluate, summarise, and communicate critical information. Popular tools for asynchronous instruction include *WebCrossing*, *SiteScape Forum*, *The Ultimate Bulletin Board*, *Nicenet*, *FirstClass*, *WebBoard*, and *Caucus*. Naturally, some of these (e.g., *FirstClass*) have more features than others.
5. **Course Management Systems (CMSs) and Learning Management Systems (LMSs).** Course management tools are used by universities to coordinate the offering of online courses to learners. These systems might include tools for discussion, chats, profiles, file uploading and downloading, virtual teaming, Web link sharing, polling, testing, and grading. In addition, they typically record computer usage data. Common systems here include *Blackboard*, *WebCT*, *eCollege*, *Angel*, and *Desire2Learn*. Open source courseware alternatives include *Moodle* and tools from the Sakai Project. In the corporate training sector, the term learning management system (LMS) is more extensively used. In a nutshell, an LMS can help deliver content, track learners, conduct assessment, and build competencies. Common LMS vendors include SumTotal (formerly Docent and Click2Learn), Saba, Plateau Systems, Generation21, and THINQ.
6. **Collaborative Tools and Work Team Support.** There is increasing interest and attention toward collaboration and team activities in both higher education and corporate settings (Bonk, 2002). As Peter Drucker points out, there is a societal need for knowledge workers who can effectively problem solve, work in teams, and continue to learn. Collaborative tools that familiarise learners with these new expectations have been built for project management, surveys, and teamwork. Packages such as *Collaboration Edition* from Documentum, *PlanView*, *TeamSite* from Interwoven, and *Quantum Collaborate* from Entopia support teams through a project lifecycle with real-time chats, whiteboarding, threaded discussions and other collaborative tools to track schedules, manage resources, address issues, and create deliverables. Such workplace tools enable team members to share data, negotiate work schedules, send review reminders, track document development, check on the status of projects, and assign roles for aspects of projects. The rise of tools for collaboration has fostered an interest in the effectiveness of virtual teams and work groups.
7. **Digital Libraries.** Digital libraries contain links to electronic documents (text, video, images, animations, etc.). Typically, a digital library is created for a specific subject matter area or discipline (e.g., French poetry, explorers of the 17th century, energy alternatives, etc.). Such libraries might be used by online instructors and students for directed searches and to expand

the content of a class beyond standard textbooks and resource materials. They might also open up an online class for student self-direction and exploratory learning. A unique portal of such digital libraries, LibraryShare.com, can be searched for specific types of content or libraries.

8. **Digital Portfolios.** The use of portfolios can provide online displays of one's learning or work in one or more areas (e.g., for examples see Alverno College: <http://ddp.alverno.edu>; IUPUI's Institutional ePortfolio: www.iport.iupui.edu; or Minnesota efolio project: www.efoliomn.com). Digital portfolios of students progressing through an online program will provide instructors with valuable clues about learner progress, self-awareness, and risk-taking. Learners might include objectives, philosophies, sample work, presentations, pictures, employment histories, resumes, and current projects. By using such tools, institutions will have a better grasp of the quality of work from the students they are credentialing. At the same time, students will have more detailed information to provide potential employers. Portfolio tools and vendors include *Folio* from *e-Portfolio* from Chalk and Wire, *iWebfolio* from NuVentive, *Folio* from ePortaro, *FolioLive* from McGraw-Hill, *Web Folio Builder* from TaskStream, and *ePortConsortium* from UCLA and IUPUI (Educational Pathways, 2003; see www.trainingshare.com/resources/links.htm).
9. **Electronic Books.** An e-book is text that has been digitised and perhaps re-purposed for various uses. It is often made available online or on CD. In moving beyond a traditional textbook, an e-book may embed instructor as well as student notes and annotations within it. Students might also highlight the electronic text, pose questions, take electronic notes, explore embedded simulations, and answer online polls and other test questions. E-books expand the geographic range for a course as well as the presentation formats and associated content interpretations. Electronic book vendors include Metatext from Xanadu, Books24x7, Questia, and ebrary.
10. **Games and Simulations.** The Web offers opportunities for learners to test their skills in environments that approximate the real world. For instance, a learner in a school of education might interact with virtual teachers, students, parents, and principals in a simulated secondary school. Biology students might use a simulation to dissect online frogs or other animals in virtual experiments. Introductory psychology students might attempt to solve different decision making, reaction time, and Gestalt problems. And business majors might see the impact of changing different variables in product costing or distribution. To clarify the options, Aldrich (2002a, 2004) provides an excellent overview of the types of simulations available and their respective advantages and disadvantages. In addition to simulations, online games will soon help learners review content in a fun way, including games embedded in cell phones and wristwatches that can be downloaded from university Web sites.
11. **Handheld and Palm Devices.** Handheld devices allow for input of data using sensors, probes, and other devices that can be quickly uploaded to the Internet for additional analyses and sharing. Immediate areas of application include science fields where data collected in the real world can be recorded, analysed, categorised, compared, shared, and reused. One handheld device, the personal digital assistant (PDA), was coined by John Sculley, President of Apple Computers, more than a decade ago. Today, PDAs offer Web browsing, e-mail, instant messaging, and a cell phone as well as tools such as personal calendars, file uploading and downloading, and distribution lists. Such multi-function handheld devices expand the opportunities for and power of learning.
12. **Instructor Portals.** Instructor portals are online Web sites wherein lecturers, professors, and support staff can share and find information that might help them teach better or connect one's class to other classes around the globe. Additionally, instructor portals might allow college professors to find new positions or online courses to teach. In effect, they create a free market exchange of ideas and expertise within higher education. For instance, the MERLOT site,

mentioned earlier, is an example of an instructor portal. Here, college instructors, administrators, and staff members share and peer evaluate course materials. Educators can use this free portal to find information in nearly any discipline. Another instructor resource portal, CAREO, is a similar type of online repository developed at the University of Calgary.

13. **Intelligent Agents.** As the information economy generates and multiplies information and knowledge, the Web simultaneously expands. As a result, there are now too many areas that one must keep track of to maintain expertise in a given field. There is a pressing need for online tools and resources that help learners as well as instructors keep track of information in a particular area. Intelligent agents or personalities provide help or support structures that find, filter, interpret, and synthesise information. As with the calculator and the computer, there will initially be questions about whether learners will be allowed to use these devices to expedite their learning. However, as instructors and administrators observe and use agent technology in their own jobs, they will likely find increasing acceptance in online learning.
14. **Interactive News Media.** Events, activities, and announcements in the daily news are now often illustrated with animations, simulations, and supplemental material. As a result, online news stories are often explained with short videoclips, sound, and PowerPoint slides. Flash animations are becoming an increasingly powerful and cost effective way to illustrate current events. The speed in which news reports can be converted to interactive media is often amazing. Reporters such as Andrew Revkin of the New York Times are often working from an outpost at or near the North Pole (Revkin, 2003a), a base camp at Mount Everest, or an iceberg in Greenland (Revkin, 2004).
15. **Internet-based (IP) Videoconferencing.** With the emergence of the Internet II, it is now possible to send large files of video and image content over the Internet. In fact, with proper hardware, the connection for IP-based videoconferencing is free. There are many advantages to universities for using IP-based systems in addition to the fact that there is no cost to the audio and video data transfer. For example, these systems do not require as large an investment in equipment and networks as ISDN systems. With ISDN-based videoconferencing, the system hardware is typically controlled by the university instead of the instructor, procedures for room use are often tedious and time-consuming, and certain rooms have to be available. In contrast, IP-based videoconferencing solutions are easier to operate, do not require as much training, often are more informal and relaxed, and reduce the need for a specialist to maintain the system (Khan & Hirata, 2001; Pacific Bell Videoconferencing Guide, 2004). As a result, there is more focus on content and student interaction with such systems. In effect, power is placed in instructor and learner hands to be creative rather than with the technician or administrator. Using videoconferencing, a college instructor might connect learners in multiple locations or countries for a discussion, bring in guest experts, conduct a mock trial, foster student team interaction or collaborative tasks, or hold a research meeting. Borja (2003) pointed out that during the spring of 2003, students in schools in Beijing, Singapore, and Hong Kong used Web-based videoconferencing and other forms of online learning to keep up with their classes during the outbreak of SARS. In work settings, employees in China and other parts of Asia were often trained via teleconferencing and Web-based videoconferencing. Recent experiments at MIT demonstrated that someone speaking in Singapore could be heard in less than one second at MIT in Boston using Internet II technologies.
16. **Massive Multiplayer Online Games (MMOGs).** One fast emerging technology, massive multiplayer online gaming (MMOG), allows users to interact with others in fictional worlds around the globe in real-time (Bonk & Dennen, in press). MMOGs are "highly graphical 3-D videogames played online, allowing individuals, through their self-created digital characters or "avatars," to interact not only with the gaming software (the designed environment of the game and the computer-controlled characters within it) but with other players' avatars as well" (Squire & Steinkuehler, in press). Unlike most games and simulations, MMOGs are persistent

worlds that are filled with both social and material exchanges. In these worlds, a loose structure is maintained through fantasy and rich stories wherein players have many choices or decisions that confront them. Such choices might include whether to slay a dragon or an ogre, raise someone from the dead, siege a city or a castle, hunt for food, trade goods and services, or be the village idiot (Kolbert, 2001; Squire & Steinkuehler, in press). Schatz (2001) predicts that MMOGs will be where most gaming developments and attention will reside in the coming decade. Among the more well known MMOGs are *Anarchy Online*, *EverQuest*, *Asherton's Call 2*, *Ultima Online*, *Lineage*, *Final Fantasy XI*, *Star Wars Galaxies*, and *Dark Age of Camelot*. Some of these multiplayer games have hundreds of thousands of members or players who might play these games on average 10 to 20 hours per week (Herz & Macedonia, 2002; Shwayder, 2004; Woodcock, 2004). Of course, the continued increase in computer processing speed, added hard disk capacity, availability of higher bandwidth, and the general plummeting of hardware costs, will add further fuel to the mushrooming demand for MMOGs. The U.S. Department of Defense is exploring how MMOGs might be used for decision making, planning, and other higher-order thinking skills, in addition to the perceptual skills that they normally have been associated with (Bonk & Dennen, in press).

17. **Online Quizzes and Exams.** With the fairly sudden rise of online learning courses, programs, and degrees, one area of critical importance is online assessment and evaluation. Tools for assessing online learning and learner progress through a course are vital. Most commonly, an online testing tool or module is embedded within online courseware or a learning management system. Stand alone products such as those from Questionmark, Test.com, and Principia Products allow users to create, deliver, and report on tests, quizzes, assessments, and surveys. It is useful for such assessment devices to link to digital portfolios and online gradebook tools. Obviously, online testing tools expand the options for where and when learning and evaluation can take place. Such tools will gain even more respect as society continues to push for credentials and job reskilling opportunities that enhance or extend one's career.
18. **Online Surveys and Polling.** Survey and polling tools provide a means to sample students and obtain formative as well as summative feedback on a course. In addition, they grant students a voice in the ongoing activities of a class. A survey might be used for course evaluations, student voting on issues, or research. Products such as those from *InfoPoll*, *WebSurveyor*, *Zoomerang*, *KeySurvey*, *SurveyKey*, *SurveyPro*, and *SurveyShare* allow users to create, deliver, and report on surveys. Online surveys often can be created from item banks, system templates, previous surveys, or some combination of those options. Some online surveys often have options for survey reminders, survey scheduling, and the sharing of results. In addition, online surveys might be public (Web link based) or private (requiring a specific e-mail address, password, or keycode). They might be used in higher education for course evaluations, formative assessment, student voting on issues, alumni information, employee feedback, and Web site evaluation.
19. **Online Homework and Gradebooks.** Closely connected to online surveys and exams is the posting of student homework online and recording their grades. Companies like YourHomework.com provide online homework support for teachers, students, and parents. Such tools open a window into student progress, attendance, and achievement. Online gradebooks allow students to monitor their own work and instructors to provide timely feedback on it.
20. **Online Language Learning.** There are a number of tools and portals emerging to teach a language online (e.g., Global English, Englishtown) as well as to certify the learning of that language. While English is perhaps the most popular online language today, the number of online languages is growing. It is plausible that individuals will soon have online access to technological and human mentors for nearly any language they want to learn. At the same time, emerging language translation tools such as *Deja Vu* from ATRIL will likely spark even

greater cross-cultural exchanges and collaborative documents or joint products across languages and cultures.

21. **Peer-to-Peer Collaboration.** There are an assortment of tools and technologies emerging for learner collaboration (Bonk, 2002). In addition to music sharing, peer-to-peer tools might help learners share content, resources, and ideas. Of course, many will conclude that such technologies pose a significant dilemma for students since they can lead to increased course cheating and plagiarism. Already there are Web sites or portals such as Academic Term Papers where students can buy a term paper on nearly any topic at about \$7 (USD) per page. At the same time, tools such as *Groove* allow learners to hold group meetings, write and edit documents, and turn in assignments electronically. In addition, *Groove* users can open multiple windows on their computer screen and discuss edits, collect additional information, and view shared data. And if users decide to continue their work offline, it is automatically updated as part of a shared workspace when they log back in. The ability to work offline and sync back up offers enhanced opportunities for students to work in teams without having to meet physically.
22. **Reusable Learning Objects (RLOs).** Perhaps the most widely discussed and debated online technology during the past few years is reusable learning objects (RLOs). RLOs are digital resources, from small chunks of knowledge to entire courses, which allow for a learning experience. As standards are developed in this area, RLOs will enable learning content or materials (e.g., PowerPoint slide shows, video and audio clips, animation sequences, etc.) to be reused or repurposed for other modules, courses, or programs (Longmire, 2000; Wiley, 2001). Hence, if someone creates a course in one learning platform (e.g., WebCT), the RLO components can be used in another (e.g., Blackboard). When such interoperability is proven and accepted, it should increase the money spent on developing online content, and online courses in general, while ultimately reducing the cost of online learning. In addition to interoperability, RLOs should be durable, maintainable, accessible, affordable, and, of course, reusable. There are currently many pressing debates on this topic, including just what is a learning object and what length of learning sequence will qualify as a RLO.
23. **Synchronous Conferencing, Live e-Learning, or Virtual Classrooms.** Since the events of 9/11, the use of synchronous or real-time technologies has been expanding rapidly; especially in corporate training environments. One common use is for Webinars where someone is featured to present at a set time. In higher education settings, synchronous conferencing or presentation tools might be used for guest expert interviews, student discussion, office hours, Webcasts, study groups, virtual classes, team meetings, special help, and individual testing. Synchronous tools include online PowerPoint presentations, public and private chat, electronic whiteboards, quick polls, application sharing, video streaming, audio conferencing, and Web touring. They might also include hand raising, break-out rooms for private discussions or group work, and archived events. Of these, the chat tool is the most salient and important (Webb, 2001). Popular synchronous training tools and vendors include Centra, NetMeeting, LiveMeeting, WebEx, Interwise, and HorizonLive. Most recently, Macromedia has produced a highly popular synchronous system called Breeze. Synchronous conferencing tools are increasing in higher education settings. As a result, tools like HorizonLive are now integrated within course management systems such as WebCT and Blackboard. Synchronous tools bring a sense of social presence to the online class since they allow students and instructors to see each other. In addition, these tools help instructors provide timely and informative feedback on student work which is crucial to the success of an online class. The eClassroom from Learnbydoing (<http://www.learningbydoing.net/>), designed at Stanford University, offers a real-time interactive text, image, and messaging system (Neubauer & Lobel, 2003). In the eClassroom, participants can include a personal picture and emoticons with their posts which they can enlarge to obtain greater screen control or to make a point (Shi, Mishra, Bonk, & Tan, 2004). Users can also post Web links that others can select or browse. Importantly, their real-time discussions can be visually quantified and represented to show neighbourhoods and

communities of participant interaction.

24. **Tablet PCs.** Tablet PCs provide two computers, a laptop with keyboard and a computer that can digitally interpret and convert handwriting and notetaking. Tablet PCs allow users to write on a computer screen just like they would on a pad of paper. While Tablet PCs promote personal reflection and notetaking, the real power may be in the mobility of this type of computer. With synchronous collaboration, Tablet PCs (e.g., DyKnow) can make an online class more interactive through instructor questioning and subsequent global posting of student responses (Schnitzler, 2004). Additionally, any handwritten notes, drawings, or ideas made during a class or meeting can later be manipulated or emailed to others. While sales of Tablet PCs account for just 1 percent of the portable computing market today, by 2007, they might account for more than 20 percent (Wired News, 2003).
25. **Video Papers.** TERC, a not-for-profit education research and development organisation based in Cambridge, Massachusetts, created a software system called video papers, which enables learners to combine text, videos, images, and other media into one presentable product (Cogan-Drew, Olivero, & Beardsley, in press; <http://vpb.concord.org/>). A video paper author can create navigational links, slideshows, and connections between the media used. This technology can help learners organise media for presentations. It might also highlight standards in a profession such as accounting, law, nursing, or education with the text of the standard in one window and a video of an expert in action in another. For instance, it might juxtapose teaching standards for preservice teachers against their early teaching trials and experiences. Video papers also allow for nonlinear reading of text and multiple interpretations of information. A key premise of this technology is that the learner will focus on the representation of information and content of research rather than on the technology itself. One open source example for PC or Macintosh platforms, the VideoPaper Builder project, now resides with the Concord Consortium (<http://vpb.concord.org/>).
26. **Video Streaming.** The use of video streaming has exploded in recent years. It could become a \$4.5 billion market by 2007 (Olsen, 2003). Once lectures are recorded, they can be reused and shared for subsequent classes or stored as reference materials (Lindsey, 2003). Thus, they can now be made available upon demand. This technology provides a new way for the production and marketing of an online class. For instance, video streamed content can also be used as teasers or marketing material for potential students and instructors. In addition, they might be viewed by students who attend a class to make sure that they understand the content (Olsen, 2003). Videos of well known scholars from workshops, conferences, or special institutes might be made available for others to watch.
27. **Virtual Worlds/Reality.** Virtual worlds like Quest Atlantis (Barab, Thomas, Carteaux, & Tuzun, in press; see <http://atlantis.crlt.indiana.edu>) can model real environments (e.g., a wetland, art museum, or another planet like Mars), fictional/fantasy locations, or present novel worlds in which people can interact with each other and other entities (see There; <http://www.there.com/index.html>) and Active Worlds; see www.activeworlds.com). These environments can be designed to work in any manner but they generally enable learners to explore new worlds, experiment with objects found, conduct investigations, find answers to questions, build unique items for the virtual world, and interact with other people. Virtual worlds might find use in fields such as history, architecture, art appreciation, political science, psychology, education, theatre, ethics, literature, environmental science, and, of course, information technology.
28. **Voice Information Retrieval Tools.** With voice information retrieval programs, computers can now respond to voice commands with requested information. Such technology may alter the search strategies of online students. Instead of typing in search requests, learners can now state their queries, make suggestions, and pose questions to a computer and await an answer. In addition to computer workstations, such software will certainly enhance mobile technologies

such as mobile telephones, handheld computers, and personal digital assistants. One of the first voice information retrieval programs is *SoundAdvice* from Telesensory.

29. **Wearable Computing.** Computing devices are shrinking in size to the point where they can easily be worn on the body or carried in a pocket. Developers are integrating a large array of devices to work with these computers including miniature video cameras, systems that know where you are located and where you are looking, and wireless communication. In addition, some wearable computer screens can be worn on your head or attached to eyeglasses, carried in your pocket, or sewn into the sleeve of your clothes. These technologies enable virtually any kind of computing while mobile. For instance, while wearing a head-worn display device, a professor might view her schedule as she is walking down the hall to class. At the same time, it might automatically display the names of people she is passing in the hall. Perhaps more importantly, when in class, her lecture notes might appear as needed. At the same time, all of this data can be sent to others located either nearby or at distant sites.
30. **Wireless Technology.** As learning becomes increasingly mobile and flexible, it becomes more important to connect to the Internet without plugging a computer into a wall jack. At present, the industry standard for wireless networking and access from home, school, or business is called Wi-Fi (Dayton & Worrell, 2003). With wireless technology, there is no need for a computer to be "plugged" in to be connected though one needs to be near "hot spots" or access points. Such technology frees instructors and students from hardwired classrooms and labs to any space that has wireless access. Unfortunately, there is not total flexibility here since the learner must go to where broadband access exists (Tanner, 2004). Wireless technology is proliferating in college campuses. As evidence of this trend, nearly 80 percent of U.S. college campuses which participated in the 2003 Campus Computing Project already had at least some wireless access on campus (The Campus Computing Project, 2003).

2.2 Technology-Based Activities

Naturally, most of the above educational technologies can be used in multiple ways and many have yet to make a significant impact in higher education. And when combined, they can offer unique learning activities and opportunities. Three examples of such technology-based activities, (1) adventure learning; (2) online mentoring; and (3) online communities of learning and communities of practice, are described below.

2.2.1 Adventure Learning

Adventure learning was created in the 1990s to engage learners in the adventurous study of the global environment (Siegel & Kirkley, 1998). Adventure learning provides learners with a more immediate connection to a real-world exploration or activity using technology. Tools and activities for adventure learning include virtual fieldtrips, ask an expert forums, cross classroom collaboration, debate forums, and electronic apprenticeship or mentoring.

The proliferation of technologies such as blogging tools, digital cameras, and wearable technologies has created numerous ways for explorers and adventurers to share their learning journeys. There are now expedition summaries and reflections that can be found online at ThePoles.com (www.thepoles.com), and ExplorersWeb.net (www.explorersweb.com), and MountEverest.net (www.mounteverest.net). The journals, pictures, and audioclips of explorers hiking up Mount Everest or conducting experiments at the North Pole are now instantaneously updated. Such sites include the chronicles of a family traversing Greenland, the blogging notes and pictures of the first individual to dive solo at the geographic North Pole, summaries of the first marathon run at the North Pole (which 15 people completed on April 10th, 2004; www.npmarathon.com), and pictures of a husband and wife team taking pictures at the South Pole using handheld technologies or belt-mounted computers with head displays (Revkin, 2003b). Explorers might also share real-time data and videoclips from research experiments they are conducting by posting it to the Web or sending it directly to students. In one research project, explorers responded to student questions and comments about their experiments and sent them daily updates of their progress (Sugar & Bonk, 1998).

It is now common for adventurers to use recent technology to promote their exploits as well as advertise the products of their sponsors. Competition among explorers to see who can post or transmit the most information or the most recent information simultaneously opens new windows for learning—free resources, in fact-- that educators need to begin taking advantage of. In higher education, such exploration Web sites might be incorporated into classes in archaeology, geography, geology, earth science, environmental ethics, politics and society, climatology, outdoor education, biology, botany, and many other disciplines.

For those wanting more local activity or events, the Digital Exploration Society (see www.digitalexplorers.com) allows younger students go to the field and gather data and then send back live images to their peers and classmates who vicariously participate. According to Sonny Kirkley, President, Information in Place, Inc. (June 10, 2004, personal communication), adventure learning is primarily about bringing a remote adventure to the classroom and using it as a stimulus to have your own adventures and explorations.

2.2.2 Online Mentoring

In addition to adventure, another educational option made possible by the Web is online mentoring (Bonk, Malikowski, Angeli, & East, 1998). However, because of bandwidth, language, and awareness issues, it has yet to come close to its potential. Online mentoring from experts, practitioners, and peers might provide help, hints, and scaffolded assistance on the Web. Such support can be directly related to a unit or content area or it might extend across a set of course experiences. In either case, there will soon be a burgeoning market looking for online mentors who can provide practical insights and wisdom.

With all the mentoring sites that have emerged during the past decade, nearly every discipline or field now offers some type of online mentoring or expert support. Online mentoring might be in the form of questions sent to experts and responses received via email, synchronous chats with experts at set times, or expert evaluations of learner products and ideas. Such sites can support expert feedback and mentoring that was previously unavailable. Consequently, there are now opportunities for apprenticing learners and bringing them into the periphery of learning communities that previously were unavailable to them.

In higher education, it is vital to begin to understand the online mentoring process since there are so many possibilities as well as unknowns. In fact, most of those teaching online do not have a degree or even a certificate in distance education. Consequently, they need to understand the options they have for mentoring online students and assisting them in the learning process (Bonk, Angeli, Malikowski, & Supplee, 2001; Sugar & Bonk, 1998). They need to have a sense of where different techniques are more effective and what disciplines or online experiences might benefit from online mentoring. These issues will rise in prominence as synchronous technologies become used more often in online courses and experiences.

2.2.3 Online Communities of Learning and Communities of Practice

The goal of many online instructors is to create virtual teams, classes, or communities which experience synergy and feel a need to help and support each other. In a community of learners, there is sense of identity, membership, shared knowledge, rituals, respect, and recognition for one's accomplishments (Chao, 2001; Wenger, 1998). There are typically shared goals and a shared space to work collaboratively to meet those goals (Bonk, Wisher, & Nigrelli, in press; Schrage, 1990). Communities of learners may alter the format of an online course or program, since students may not want the course experience to end or they may want it to continue in their succeeding courses.

Tapped In is an online professional development community that utilises synchronous conferencing teacher and instructor professional development (Schlager, Fusco, & Schank, 2002). Thousands of school teachers, staff, and researchers utilise Tapped-In for professional development and informal collaborative activities. Tapped In fosters both formal and informal learning that emphasises collaboration and social interaction in an online community of practice. Using this resource, teachers

with diverse skills and interests can meet whenever they want, learn about new programs, trends, or initiatives, and find resources and materials that they might use in their respective classrooms.

With this synchronous conferencing system, the users of Tapped In meet in different floors, offices, or meeting rooms which they can name and furnish. Once there, they can share documents, chat with guest experts, post items in their own workrooms, collectively browse Web sites, and interact via mailing lists and discussion boards. In effect, Tapped In helps overcome teacher isolation by providing a rich sharing of experiences and resources while also recognising and rewarding participant achievements.

In contrast, the Inquiry Learning Forum (ILF) relies on asynchronous conferencing about best practices to support a virtual community of practising math and science teachers as well as preservice teachers across many disciplines (Baek, 2002). The ILF contains videoclips of expert math and science instructors delivering different aspects of their lessons. In addition to the videoclips, in each online module there are lesson plan transcripts, examples of student work, links to lesson plans, various Web resources, and teacher reflections on how well it went. Finally, there are online discussions about all this content among special interest groups, including preservice as well as practising teachers. Forums such as ILF take advantage of the expertise that many adult learners bring to the learning situation while providing a means to contextualise knowledge in an authentic learning environment. By using videostreaming technology with detailed classroom visits, they situate participants in a CoP focused on ownership, dynamic adjustments to user needs, participation, and inquiry. The goal is not only to create an online community rich in resource sharing, but to facilitate dialogue about teaching practices and provide timely advice.

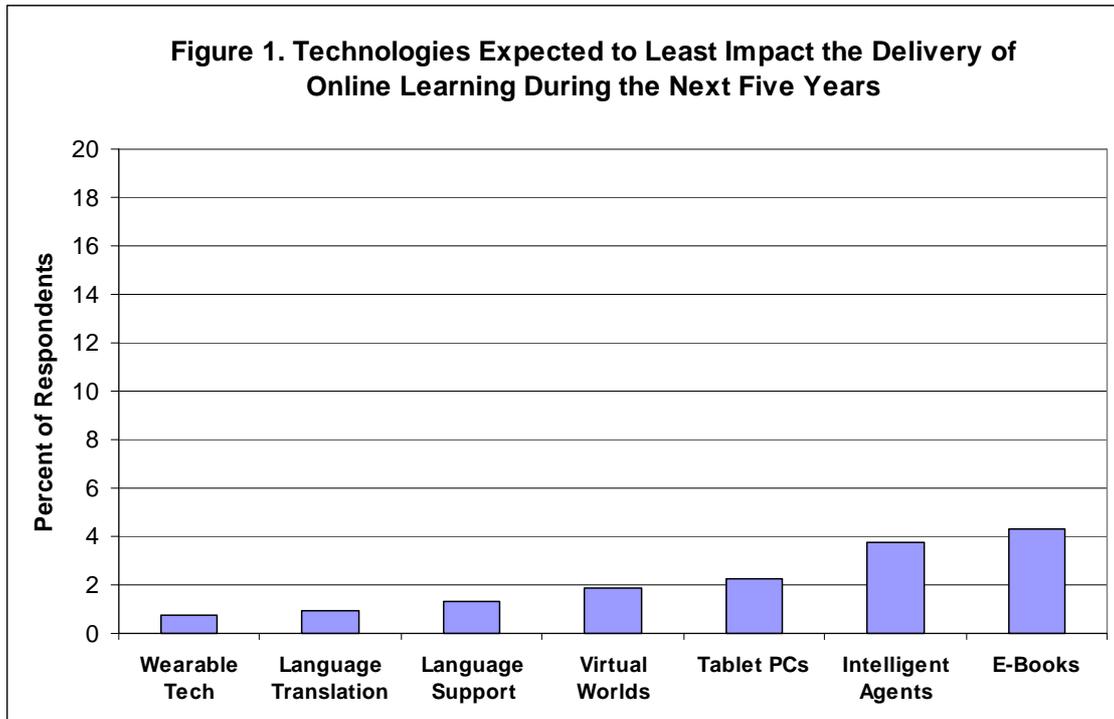
Many tools and programs like Tapped-In and the ILF exist for forming online communities of education professionals. There is also an increasing focus on using these tools to cultivate communities of practice in the business world (Wenger, 1998; Wenger, McDermott, & Snyder, 2002) as well as in college and university settings. In online courses in higher education, an online learning community might be apparent in special names or identities for team workspaces, interactive peer commenting on student work, special names given to activities or terms, celebrations of student accomplishments, use of online resources, and student overall online participation. Among the tools and features that might foster a sense of community include chat tools, calendars, instant messaging, member profiles, Web link sharing, work galleries, announcements, archives, application sharing, drop boxes, member surveys and polls, and online libraries or portals of information (e.g., online articles) (Bonk et al., in press).

2.3 Survey of Emerging Technologies Impacting Online Learning

Given the emergence of all the technologies discussed above, there is a growing need to understand which of these technologies will most impact higher education settings. In response, Bonk (2001), summarised the state of e-learning in higher education in a report, "Online Teaching in an Online World." This report captured the needs, experiences, preferences, and activities of 222 college instructors who were early adopters of the Web. Most respondents were from MERLOT; a higher education association of more than 14,000 college professors, instructional designers, and administrators who share and peer evaluate their Web resources and materials. The remaining participants were from the World Lecture Hall (WLH), which contains syllabi from more than 2,000 college instructors. That survey report recorded key support structures required, as well as the constraints and obstacles they commonly faced. In addition, it discussed implications related to online learning pedagogy, tool development, instructional design, and research.

A follow-up 42 item survey on the present and future state of online learning in higher education was conducted using *SurveyShare* from November 2003 to January, 2004 (Bonk, 2003). Once again, this survey was conducted with members of MERLOT and the WLH. Also surveyed were approximately 500 to 600 members of the Western Cooperative for Educational Telecommunications (WCET). The WCET is a leading organisation that provides resources and information regarding the effective use of telecommunications technology in learning. From these three groups, MERLOT, the WLH, and WCET, there were 562 respondents to this particular survey.

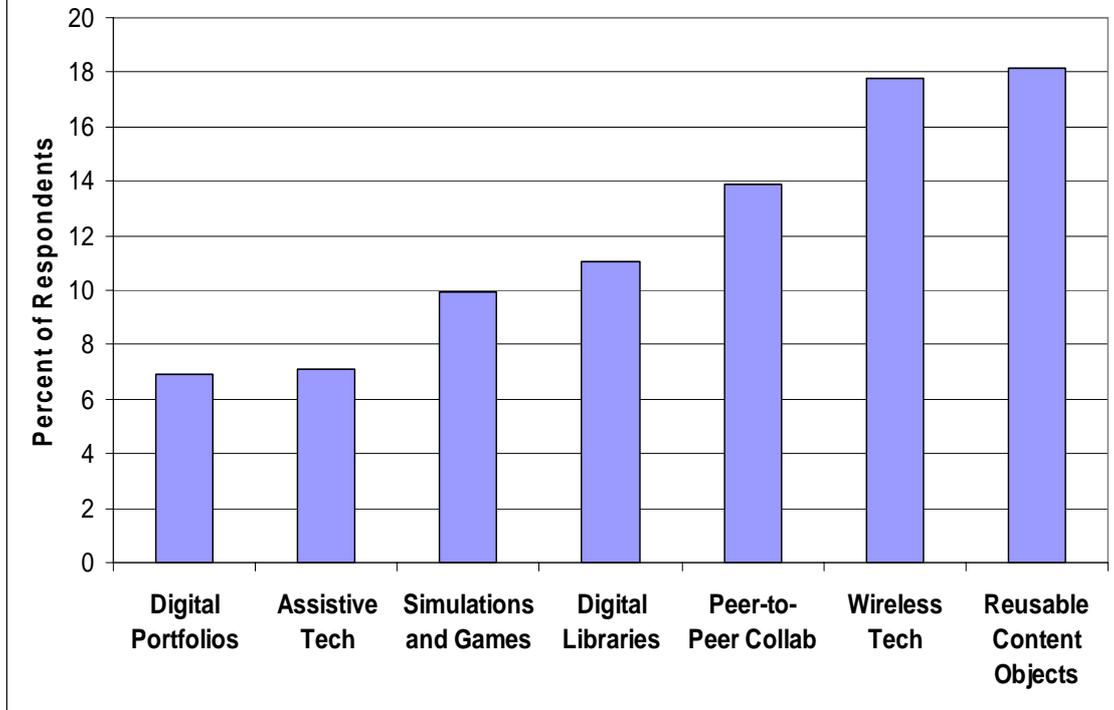
In this survey, the respondents were asked about the technologies most expected to impact the delivery of online learning during the next five years. Respondents were allowed to only select one of fourteen technologies as having the most impact on the delivery of online learning. As indicated in Figure 1, five percent of the respondents selected wearable technology, language translation tools, language support programs, and virtual worlds. Other technologies, Tablet PCs, intelligent agents, and digital books failed to receive much more support. Perhaps it was too difficult to envision the relevancy of these tools for online teaching and learning environments. Perhaps these technologies are too new. Or perhaps there were just too many to choose from.



The other seven technology options were selected by at least seven percent of the respondents (see Figure 2). For example, both digital portfolios and assistive technologies were selected by seven percent of respondents. Simulations and games were the choice of one in ten of these respondents, many of whom were early adopters of the Web. Not surprisingly, wireless technology was among the most highly predicted to have an impact on the delivery of online learning in the next few years. If access is the primary reason for engaging in online learning, then the expansion of wireless access points is simultaneously an expansion of online learning. As this occurs, the power of online learning will be felt in every corner of the planet and beyond.

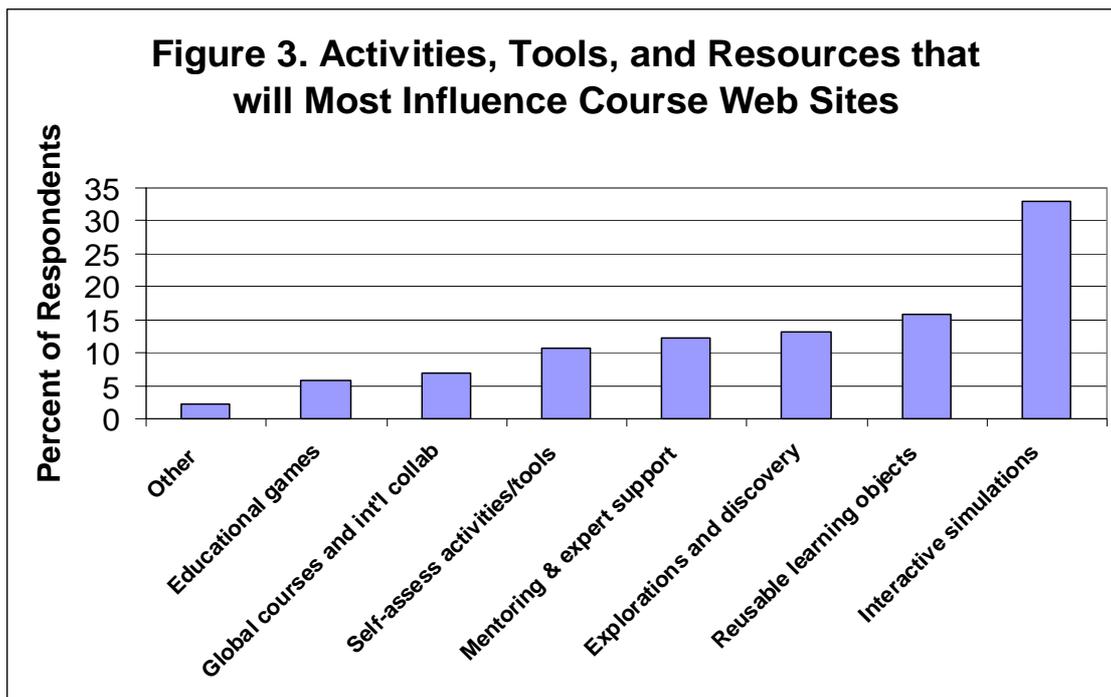
Interestingly, as indicated in Figure 2, technologies related to the sharing and reuse of content, digital libraries, peer-to-peer collaborative tools, and RLOs received the most support. Perhaps this is an indication of the recent obsession with cost effective content as well as opportunities to share such content with one's peers. In any event, most of the highly ranked items signal an urgent need for additional (or better) content in online learning environments.

Figure 2. Technologies Expected to Most Impact the Delivery of Online Learning During the Next Five Years



In terms of activities, tools, and resources that will most influence course Web sites, the selections were quite diverse (see Figure 3). In fact, few considered educational games and global courses and collaboration to be important. Deemed somewhat more important to an online course were self-assessment (11 percent), mentoring and expert support (12 percent), exploration and discovery learning (14 percent), and the use of reusable learning objects (16 percent).

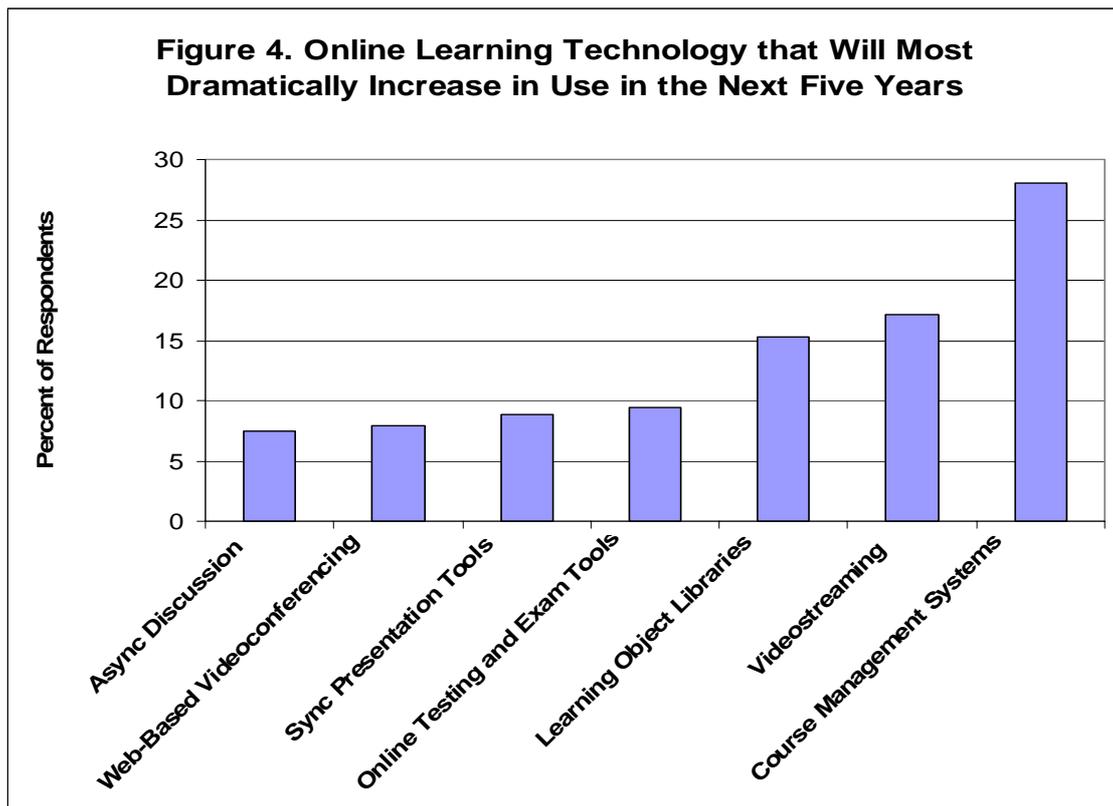
However, most important was the use of simulations which were selected by one-third of the respondents. It is somewhat ironic that educational games were the lowest rated item while simulations were the highest. Clearly, simulations are projected to be a key part of future online classes (Aldrich, 2004). This finding may indicate the importance of authenticity and relevance in online learning. It may also signify that simulation technologies are now more plausible due to increases in bandwidth, storage capacity, and processing speed. Interestingly, the two highest rated items, reusable learning objects and simulations, relate to content that can be integrated into an online class. Extending this finding further, the third most plausible response, exploration and discovery learning, is a sign that instructors want to empower the learner to find additional course content on the Web.



Finally, respondents were asked about the online learning technology that would most dramatically increase in use. As shown in Figure 4, course management systems (CMSs) were considered most likely to increase in use during the next few years; nearly 30 percent of the respondents selected this option. Such a finding may be indicative of the early nature of online learning. For many instructors and administrators, CMSs may be thought of as the gateway to online learning. As higher education institutions adopt online learning, most will need a CMS. In fact, colleges and universities might not be considered involved in online learning unless they have a CMS. CMSs were also one of the first technologies for online learning. Hence, the projected increase in use could indicate either that they will become more powerful as a learning technology, or that there will be a continued swelling of online learning participants, or both.

Two other fast growing online learning technologies, video streaming and learning object libraries, were selected by 17 and 15 percent of the respondents, respectively. In similarity to the data shown in Figures 2 and 3, both of these choices imply the need for more online learning content. Based on these findings, those charged with designing or administering online courses or creating strategic plans might search for tools and resources that extend opportunities for generating, sharing, and using online content. The other choices, asynchronous discussion, Web-based videoconferencing, synchronous presentation tools, and online testing and examination tools, were all selected by five to ten percent of the respondents. If respondent predictions come true, each will grow, just not to the extent of learning object libraries, video streaming, and CMSs.

Four technologies already in use in online environments, online gradebooks and examinations, blogs, electronic whiteboards, and synchronous chat and instant messaging, were not predicted to grow much in the coming years. In fact, each received less than three percent support as high growth tools of the next five years. These results are surprising given that two of these tools, blogging and instant messaging, are skyrocketing in use among the generation that is about to attend college. Of course, it would be interesting for online college students as well as young college faculty to answer these same questions.



Given the dramatic growth anticipated for CMSs, it is important to know the options. Popular CMS choices include *WebCT*, *Blackboard*, *Desire2learn*, *eCollege*, and *Angel* from CyberLearning Labs. However, many administrators, instructional designers, and instructors are quickly becoming aware that they are not limited to these 4-5 choices. Options to the above systems, namely two open source solutions, are provided in the erased budgets section of this report—the fourth e-storm.

There definitely is a storm brewing when it comes to emerging educational technologies for online learning. Which learning-related technologies to target or include in strategic plans for e-learning is certainly a dilemma. This section of the report hopefully provided some insight as to which directions to head. Nevertheless, any of these technologies or technology-related learning activities may seed the online learning storms currently brewing offshore. In the near term, wireless technologies may make the most significant impact in online environments. As students walk into lecture halls with laptop computers, cell phones, and various handheld devices all wirelessly connected to the Web, they simultaneously bring online learning opportunities more deeply into the traditional classroom setting. At the same time, such technologies also extend learning beyond the four walls of traditional classrooms. As this occurs, the pedagogical possibilities of every connected student and classroom multiply (Bonk & Cunningham, 1998).

2.4 Vision of Future Technology

The above technology trends present many questions and unknowns. For instance, what happens when wearable and wireless technologies more extensively shift learning from set physical locations to a series of physical and digital alternatives? Entire cultures (e.g., working, living, and learning) may change as students are immersed in new forms of online learning experiences. With advances in wearable technologies, will there be an explosion of opportunities to offer live insights into cultural, historical, educational, and work-related events. At the same time, developments in simulations and virtual world technology might shift the focus of distance education from lecturing and memorisation to performance examinations in true-to-life situations (Aldrich, 2000, 2002b). Younger generations, in fact, will enter the online arena expecting interactivity, visual effects, and rapid access to information. They

will likely be ecstatic to find their electronic books embedded with interactive simulations and scenarios to be played on demand.

While distance learning at the end of the twentieth century included explorations at the poles, in the oceans, and out to space stations, in the coming decades, interplanetary chats with explorers and astronauts as well as remote views from distant satellites or spaceships will enhance and intrigue learners. But what happens when robots and eventually humans begin to settle on Mars, the Moon, or other planetary systems? With interplanetary chats, online mentoring is bound to take on new meaning! How might such long-distance chats and associated mentoring impact online learning environments?

It is crucial to have a vision of what happens when any the technologies mentioned above are further developed and then merged into online learning tools and systems as standard features. For instance, what happens to online programs and degrees when reusable learning objects are standardised and exchanged across campuses? Just where will one receive a certificate or degree from? At the same time, will agents be prohibited during online examinations as pocket calculators were decades before? And how might speech and handwriting recognition offer new opportunities for entry into and success within online learning environments (Humer, 2002; Webb, 2001)?

Perhaps the most noticeable learning technology missing today is pedagogical courseware. Pedagogical courseware tools elevate online learning beyond placing one's syllabi, lecture notes, and course information on the Web. Instead, such tools and systems offer opportunities for student interaction, debate, role play, brainstorming, and other engaging activities (Oliver & McLoughlin, 1999; Oliver, Omari, & Herrington, 1998). The focus is on how to foster student generative learning rather than passive reception of learning. Instead of passive learning and the warehousing of students on the Web, the goal of pedagogical courseware is rich, exciting, and engaging communities of learners. Pedagogical courseware might include options for concept mapping, timelines, debate, brainstorming, comparison and contrast, role play, reflective writing, virtual teaming, and article critiques. Individually such tools exist but there is no complete courseware system that incorporates most of them (Bonk & Dennen, 1999).

The technologies in this report are just some of those that are emerging to alter or enhance online learning. There are dozens more. Any one of the above technologies can have a significant influence on teaching and learning. Each might be incorporated into online environments in a unique way. The impact will undoubtedly depend on the level and type of course, the sophistication of the learners, the incentives of the institution or organisation, and the risk taking nature of the instructor. Of course, decisions to use any of these technologies will, in part, be dependent on availability, familiarity, and convenience. Such contextual factors simultaneously add insight and complexity to the decision making process. Key factors in such decision making processes, of course, are the technology experiences and learning preferences of the online learners as well as their instructors. The next section points to the explosion of online learners in the U.S. and around the globe.

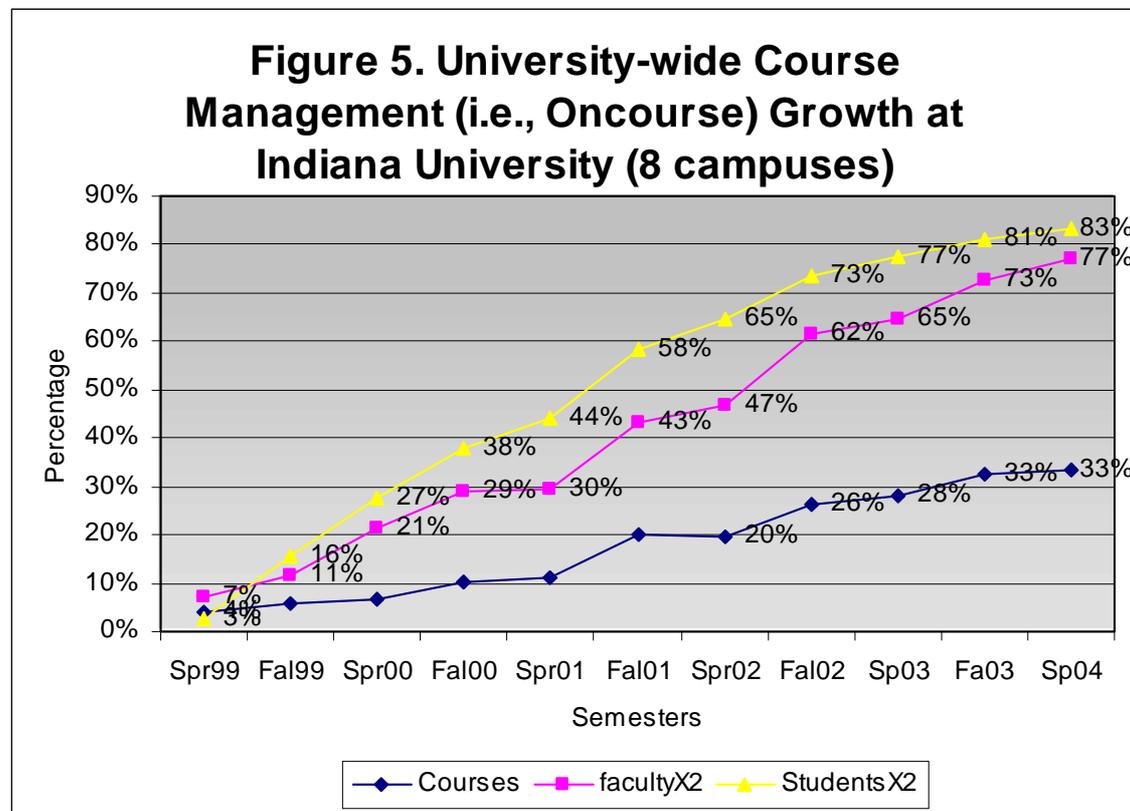
3 The Explosion of Online Learners (Storm #2)

Online enrolment trends are staggering! During the past five years, there has been an explosion in the number of online learners in secondary, vocational, college, and corporate training settings. In every sector, there is evidence of significant enrolment growth as well as associated increases in course offerings, technology spending, and resulting revenues (White Paper from Jones International University, 2002). There has been enormous learner demand for online certificate programs, MBAs, nursing degrees, and many other areas. By 2001, there were 3 million online students in the United States alone and 118,000 online courses (VanNess, 2003). According to VanNess, the University of Maryland alone had more than 40,000 online students. In fact, 17 of its 22 undergraduate programs had online courses; many of them blended with face-to-face and online components. Equally impressive, she noted that the world's largest private university, the University of Phoenix, had more than 70,000 of its 163,000 students online.

3.1 Colleges and University in the United States

Several reports during the past few years have explored the impact of online learning on adults in the U.S. For example, the Report of the Commission on Technology and Adult Learning (2001) discussed ways online technology can enhance worker skills and knowledge to enable them to find high quality jobs, advance in their careers, and generally have a positive impact on their families and society. In that report, the Commission challenged business leaders to utilise e-learning as a means of boosting productivity and performance gains by integrating it within organisational strategies and operations. Of course, state policy and higher education institution initiatives play a vital role in meeting such training needs. A report from the National Governor's Association (2001) on "The State of E-Learning in the States" detailed a plethora of examples of how states and their respective postsecondary institutions were designing new delivery systems, adding infrastructure, upgrading instructor skills, fostering technology and Internet access, and making key strategic decisions related to e-learning. If and when these states and institutions are successful in implementing this plan, e-learning becomes part of the quick and nimble new economy.

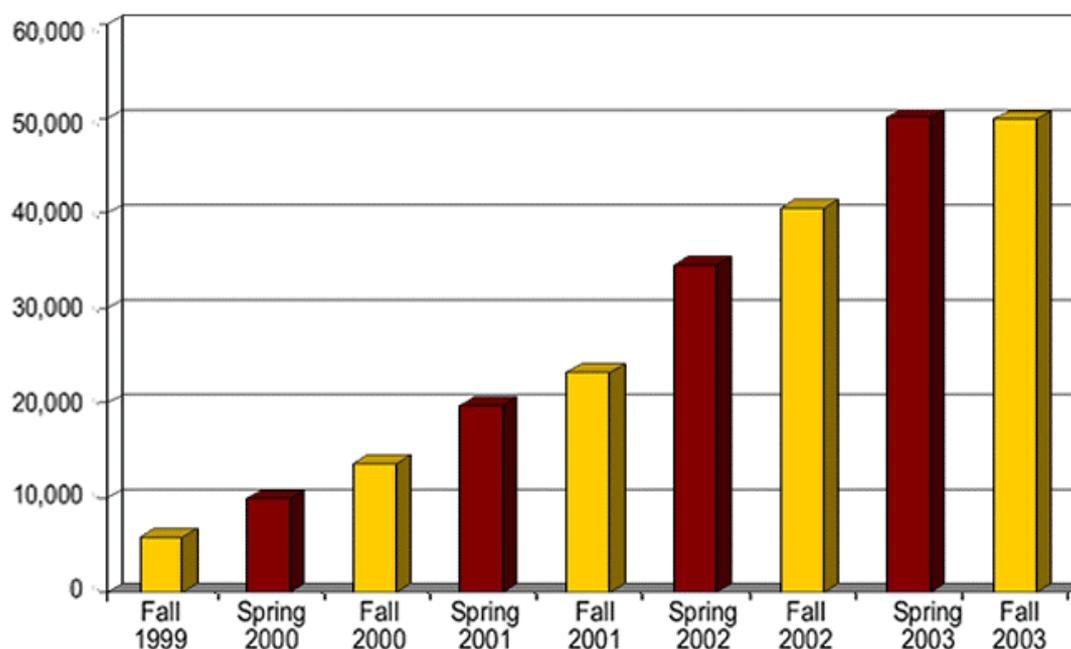
At Indiana University, nearly 90,000 students and 5,000 instructors are utilising a proprietary courseware package called "Oncourse" in more than 7,300 classes. As indicated in Figure 5, when it was first trialed in 1999, Oncourse had only a handful of courses, faculty, and students (Indiana University, 2004). According to Brad Wheeler, Associate Vice President for Research and Academic Computing and Dean of IT at IU (personal communication, May 23, 2004), at the current time, the vast majority of these courses are blended. In effect, the Oncourse system is often used for discussions, announcements, testing, grading, polling, or virtual teaming, though most of the course activities remain in face-to-face environments. While these data represent students or faculty who entered the Oncourse system at least twice during the semester, more than 85 percent of the students and faculty who were Oncourse users, utilised it more than ten times during the spring of 2004. The online course statistics in Figure 5 are lower than reality. They include all course sections, such as independent study and dissertation research courses, even when these courses do not involve regular meetings either face-to-face or online.



While the above trends are striking, online learning at IU began long before 1999. Prior to that time, units or individuals may have used most any system including *FirstClass*, *SiteScape Forum*, *Conferencing on the Web (COW)*, *Blackboard*, *WebCT*, or the *Virtual University*, to name a few. Departments taking a lead in fully online programs include nursing, business MBA, instructional systems technology, language education, and continuing studies. These same departments also tend to use blended learning, combining face-to-face classes with online classes or merging synchronous with asynchronous technologies in the same class.

Similar trends are happening in neighbouring states (e.g., Illinois, Ohio, and New York), and throughout the U.S. Due west of Indiana is the State of Illinois. The chart inserted below is from a recent online newsletter of the Illinois Virtual Campus (see Figure 6). This chart illustrates the vast expansion of online enrolments across 68 colleges and universities in Illinois (Varvel, Lindeman, & Stovall, 2003). As shown in the data from Indiana, there was a spike in online learning throughout Illinois that began in 1999. Dramatic increases extend across Illinois in the number of online courses from 962 in 1999 to more than 3,700 in the fall of 2003 (Illinois Virtual Campus, 2004). Student enrolments during this time rose from less than 10,000 in the fall of 1999 to around 50,000 in the fall of 2004. These impressive numbers do not just include online courses, but also interactive TV, open broadcast TV, stored media, and correspondence courses. However, only interactive TV and Internet courses have shown recent growth; mainly the latter. As learners are exposed to different online techniques and activities, they will demand more of their online instructors as well as the online systems they are forced to use.

Figure 6. Enrolments in Internet Courses at Illinois Colleges and Universities from Fall 1999 to Fall 2003 (reprinted with permission; Illinois Virtual Campus, 2004).



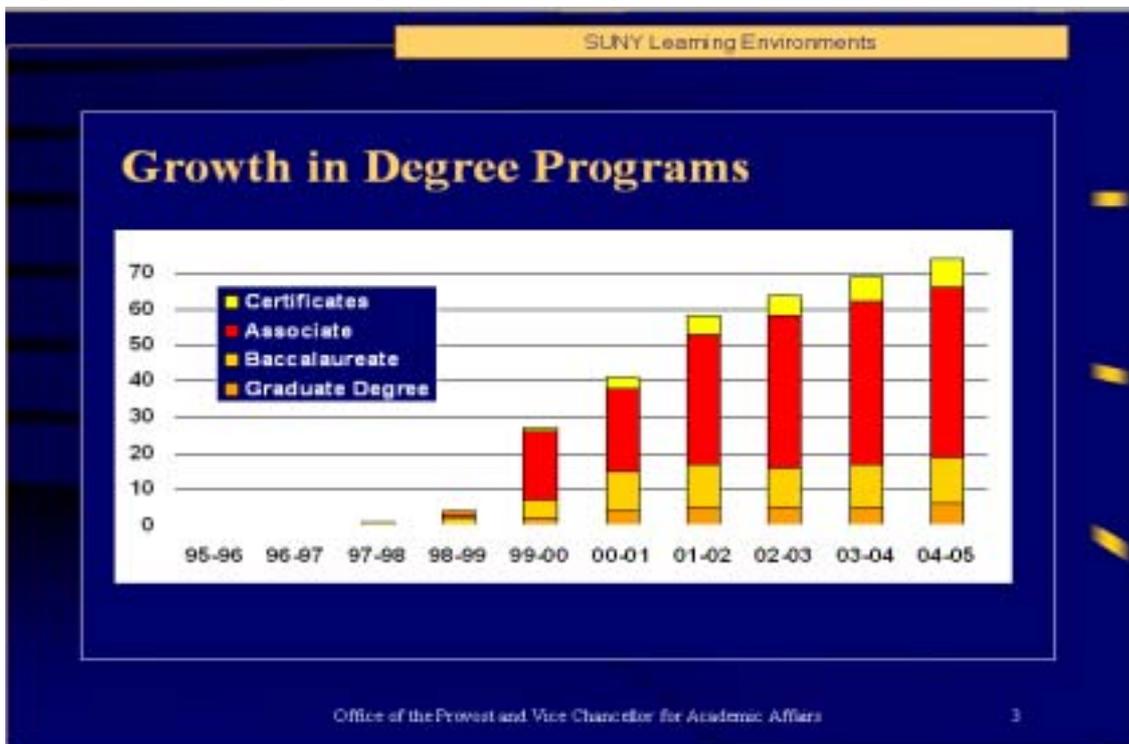
Perhaps the most ambitious university in the U.S. is the University of Illinois at Springfield. This campus recently announced plans to offer all of its 39 degree programs online (Carnevale, 2004). According to Carnevale, a \$1.21 million USD grant from the Alfred P. Sloan Foundation combined with \$400,000 USD from the university is making this complex initiative possible. While eight programs will be online by the fall of 2004, all 39 programs will take a decade to be offered electronically. Is this a revolution? Or is the fact that it will take more than a decade to accomplish a sign that the revolution is slowing down? Whatever the answer, the coming decade will probably be simultaneously exciting and painful for faculty, staff, students, and administrators at the University of Illinois at Springfield.

Directly east of Indiana is the State of Ohio. Per Tom Stone (personal communication, May 24, 2003), Instructional Development Specialist at Ohio State University (OSU), the use of WebCT had increased from around 300 students in 1999 to 25,000 in 2003 and more than 30,000 in 2004. Added to such numbers, there were an additional 5,000 students on independent servers in areas such as health sciences and math/physical sciences. Between the 2002-2003 and the 2003-2004 school year, the number of courses utilising WebCT jumped from three to five courses per student. During this same time period, course sections utilising WebCT increased from 900 to 1,800. Of these courses and students, however, less than ten percent were for fully online students and programs. Instead, OSU appears to epitomise a blended learning approach which takes advantage of the best aspects of online and face-to-face courses. And, like in Indiana and Illinois, 1999 was the bellwether year for online learning in Ohio.

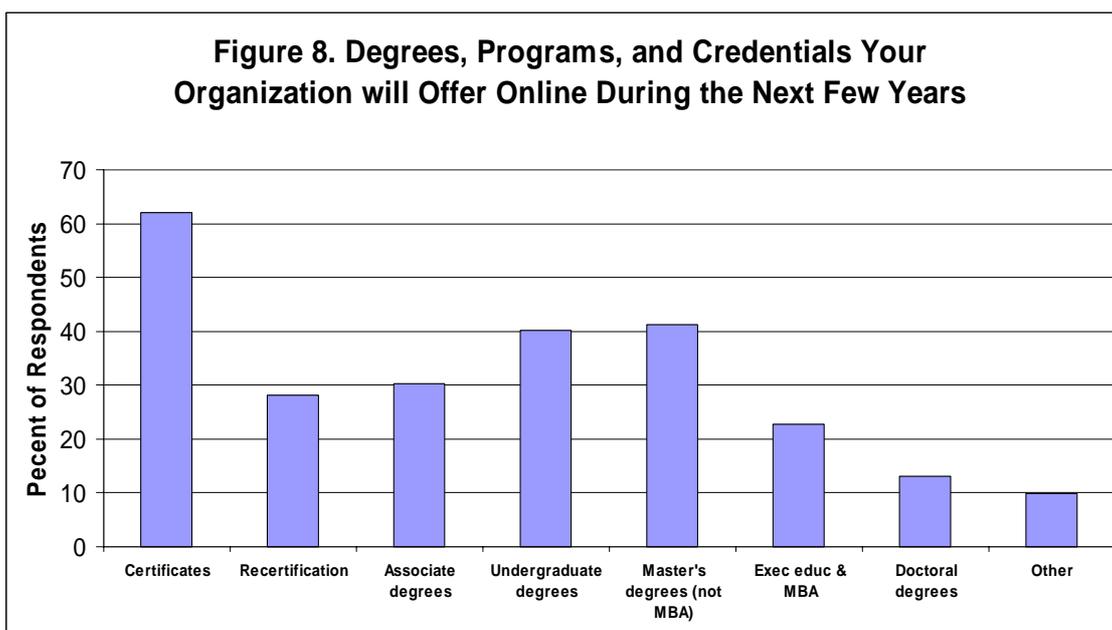
Further to the east is the State University of New York (SUNY) system where even more remarkable online numbers have been reported (Shea, Fredericksen, Pickett, & Pelz, 2004). Peter Shea, Director of the SUNY Learning Network (SLN) has overseen the explosion (see <http://sln.suny.edu>). He reports that their online enrolments have skyrocketed from around 100 in 1995-1996 to over 6,000 in 1998-1999 to more than 70,000 during 2003-2004 (Shea, Ameigh, Pelz, Benke, & Porush, 2004). Online courses have paralleled this rise, rising from less than 10 in 1995-1996 to nearly 600 in 1998-1999 to 3,600 in 2003-2004. Online enrolments and courses in the SUNY system are projected to increase about twenty percent in 2004-2005 to nearly 85,000 students and over 4,300 courses. According to Shea, Ameigh et al. (2004), the 2004 summer semester surged 40 percent higher than the previous one. To date, more than 2,000 instructors have developed and taught online classes in the SLN.

While the data demonstrating the increase in online courses and enrolments is valuable, it is also crucial to track the programs and degrees that are taken online. As Figure 7 illustrates, the explosion within the SUNY system has primarily been in associate degrees, rather than longer four year degrees or graduate programs. This is not too surprising since non-traditional adult learners seeking to enhance their careers or who never had a chance to attend college might be in those associate degree programs.

Figure 7. Growth in Degree Programs in the SUNY System (reprinted with permission).



Similar to the SUNY system findings, in the survey on the future of e-learning, discussed in Storm #1, respondents were asked about degrees, programs, and credentials that they currently offer as well as what they might offer online during the next five years. Figure 8 reveals their predictions. The main categories showing increases were online certificates which increased about 10 percent and was the most strongly supported by respondents at roughly 62 percent and recertifications which jumped from 12 percent of respondents currently offering them to about 28 percent intending to offer them. Associate degrees went up slightly from 25 percent to just over 30 percent. Respondents thought that online master's and doctoral degrees would see a slight reduction from 44 and 42 percent of respondent institutions, respectively, currently offering them, to about 40 percent each planning to offer them in the next few years.



Another university which has witnessed dramatic online growth since 1999 is National University (NU). Although headquartered in La Jolla, California and serving thousands of students in San Diego, it has offices and learning centres throughout California and now a presence in Nevada and Hawaii as well as burgeoning international offerings—all supported by an online library that features huge e-book holdings and e-journal subscriptions. From 1999 to 2002, the monthly online enrolments at NU grew from 30 to more than 3,500 (Foster, 2002). In fact, at that time, it developed a for-profit entity, Spectrum Pacific Learning Company, to help with course design and development, content management, e-learning consulting, training, and multimedia design (www.nu.edu). SPL also forms partnerships with universities and organisations outside of NU. Per Dr. Thomas Reynolds, Coordinator of Online Programs for the Department of Teacher Education (personal communication, June 6, 2004), NU was offering between 150 and 200 courses to approximately 3,500-4,000 students per month. In teacher education alone, where NU has some 10,000 students and is the largest teacher education provider in the U.S., he indicated that it had 3,000 fully online students and 2,000 more who take some of their courses online. They have also grown from 16 online undergraduate and master's programs in 2002 to 19 in 2004 in such areas as film studies, teaching, accounting, nursing, English, forensic sciences, instructional technology, and information systems.

3.2 International Online Growth

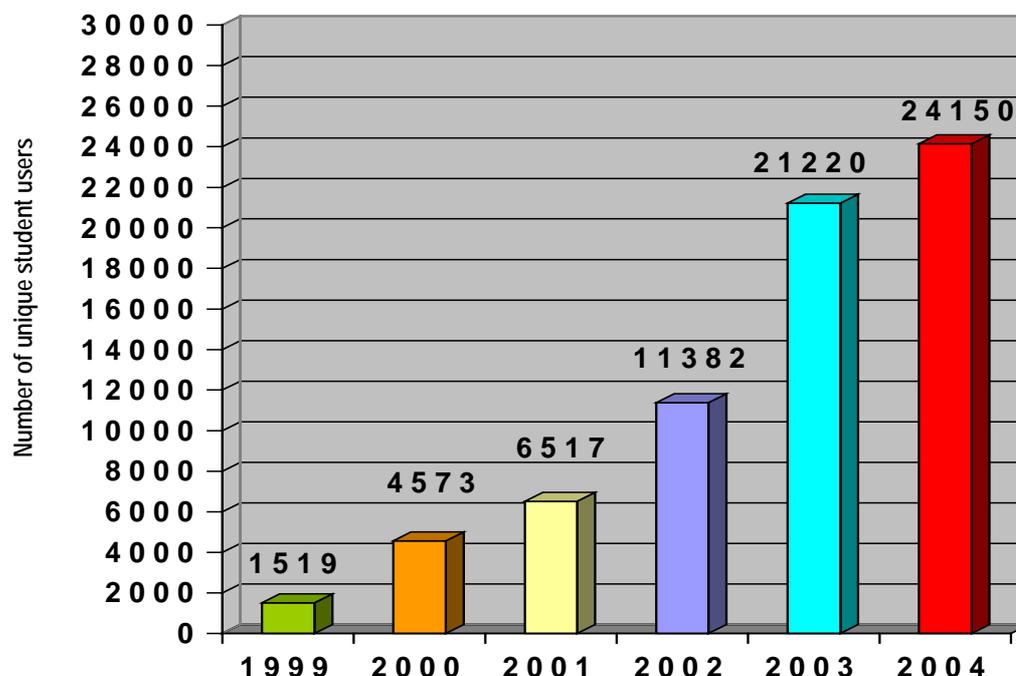
Course enrolments are escalating elsewhere in the world as well. According to Anu Wulff, Coordinator of the Virtual University at the University of Kuopio in Finland (personal communication, June 5, 2004), faculty members at her university began teaching online in 1999 using WebCT. By the summer of 2004, the University of Kuopio had 200 online courses, most of them blended, and another 334 online courses in construction. In addition, Wulff pointed out that many instructors use personal Web pages and email, which may operate outside of the WebCT system, to deliver and support their courses.

With the creation of the Finnish Virtual University (FVU) in 2001 (www.virtuaaliyliopisto.fi/index.php?profile=etusivu&pageref=0), the importance of online learning in Finland extends to all 20 universities in Finland as well as the Finnish National Defence College (Wulff, 2003). The goal of the FVU is networking among Finnish universities and the creation of joint projects. There are 289 courses in the national database of the FVU, primarily from engineering sciences, humanities, and multidisciplinary studies. Education, natural sciences, basic language studies, and social sciences are also among those represented. According to Wulff, there are many more online courses that appear in each respective university list but do not yet appear in this database.

In South Africa, the University of Pretoria has experienced monumental growth since 1999 (see Figure 9). Using WebCT in supplementing their courses or supporting their students, they have grown from around 1,500 WebCT supported students in 1999 to over 11,000 by 2002 (Lazenby, 2003). According to Engelbrecht, Harding, Lazenby, and le Roux (in press) enrolment figures in 2004 revealed that the number of WebCT supported students more than doubled between 2002 and 2004 to 24,150.

Such consistent increases in online offerings, while amazing, is likely adding tension to the work environment at the University of Pretoria. In her dissertation research, Lazenby (2003) provided a comprehensive picture of the organisational, pedagogical, and technological changes taking place at the virtual campus of the University of Pretoria. As such, she offered a fascinating look at the complexities of this process from points of view of change management, knowledge creation, instructional design, student learning, technology innovation, and customer relations management. In terms of instructional design and development, for instance, each course is subject to an extensive review and design process wherein the appropriate mix of online technologies and face-to-face contact is determined.

Figure 9. Total students enrolled in WebCT supported courses at the University of Pretoria from 1999 to 2004 (Note: chart reproduced here with permission).



According to Linda Vergnani (2000), a distance learning explosion shook throughout all of South Africa in the late 1990s. She points out that the expansion was so sudden that in 2000, the officials placed a temporary moratorium on university distance-education programs while they developed a strategic plan for the reorganisation of higher education throughout the country. It seems that after the end of apartheid, many black teachers promptly enrolled in education management programs in hopes of becoming a school deputy principal or principal; however, the supply of school administrators soon exceeded the demand. In addition to such enrolment and program redundancy issues, government officials had to deal with issues of centralisation, language, and overall distance education quality before ending the moratorium.

Heydenrych (2000) argued that, with sufficient planning, Web technologies and online learning present a plethora of opportunities in countries with limited resources such as South Africa. However, Heydenrych further noted that the initial chaotic or haphazard nature of Web innovation and competition in South Africa resulted in numerous duplicated course and programmatic efforts. He offered several ideas for collaboration and sharing of best practices across institutions to address these inefficiencies. Importantly, Heydenrych also highlighted the government's role in promoting the use of distance technology, facilitating access to learning, providing the necessary infrastructure, and helping build partnerships among all the key stakeholders.

As in the U.S., Finland, and South Africa, in South Korea there has been a similar explosion in online learning since 2000, though perhaps more strategically targeted by the government. According to a white paper from the Korean Education and Research Information Service (KERIS) (2003) sponsored by the Korean Ministry of Education and Human Resource Development, the Korean government authorized a number of cyber universities as part of a vision for lifelong learning and advanced information and communication technology (ICT). The hope was that these new forms of universities would provide affordable education to disciplines underlying a knowledge-based economy. Among the key fields of interest for online students have been business, real estate, law, hotel tourism management, social welfare, and computer graphics and animation. The KERIS (2003) report indicated that online certificate programs were highly popular. In accordance with the original goals for knowledge-based economy workers, more than 23 percent of the online courses were management related and over 21 percent are in an ICT-related field. The report also pointed out that the typical student in a Korean cyber university is older than the average freshman in traditional universities, has a high school degree or equivalent, and is employed while pursuing his or her online degree.

Presently, there are 14 four year cyber universities and 3 two year cyber colleges (Lee, 2002). Two of these universities, Seoul Digital University and the Open Cyber University, are made up from consortia of traditional Korean universities. As per Korean government policy, many of these universities exist next to traditional Korean universities but have their own buildings, deans, faculties, policies, and students. For instance, in Seoul you can find Hanyang Cyber University, Kyunghee Cyber University, and Sejong Cyber University next to Hanyang University, Kyunghee University, and Sejong University, respectively. The typical student population ranges from around 600 to about 3,000 in each of these 17 cyber colleges and universities. In total, these cyber colleges and universities offer majors in 159 disciplines; however that figure includes many duplicate programs and degrees. Updated statistics from Okhwa Lee, Associate Professor at Chungbuk National University (personal communication, June 9, 2004), reveal that the online population at these 17 Korean institutions has risen to nearly 40,000 students in just four years.

A recent report from Im (2003) focused on Hanyang Cyber University, one of the leading cyber universities in South Korea. By the spring of 2004, this online university had developed more than 100 online courses and was authorized to enrol up to 4,700 students and 8,000 the following year. According to the report from Im, more than half of the students enrolled in Hanyang Cyber University were in their 20's and another 36 percent were in their 30s, while only 12 percent were over age 40. Though they came from all sectors of the economy, the largest demand was from office workers (26 percent) and the unemployed (15 percent).

In a brief report on the state of these cyber universities, Garrett (2003) noted that while early enrolment indicators were promising, growth had not been as strong as expected. He suggested that student recruitment was perhaps hampered by the lower value placed on Korean universities compared to studying abroad. In addition, Garrett pointed out that many conventional universities simultaneously were creating online programs in addition to their stake in a cyber university. On top of that, Garrett questioned the "build it and they will come" mentality of the overall cyber university initiative. He argued that such an approach did not focus enough on the required technology, pedagogy, management, and marketing. He cautioned that issues of over-capacity, instructional quality, and marketing found in South Korea also are prevalent in virtual universities in other parts of the world.

Along these same lines, Lee (2002) argued that lack of an online university model has limited the growth and effectiveness of the cyber universities. The curriculum, services, and students are different from the traditional university. In her research on Korean cyber universities in 2002, Lee discovered that of the 27 majors of cyber universities, only 7 were unique. In addition, the roles of faculty members of a cyber university were different from those at a traditional campus. Her study found that faculty members at cyber universities were saddled with more administrative responsibilities and higher teaching loads than campus-based instructors. In fact, it was typical to find just one full time faculty member in a department. Still, she notes that the cyber universities have attained fairly quick success by affiliating with the campus-based brand name.

Clearly there is a storm brought in by the enormous learning demand for online learning. It is important, therefore, to prepare for that storm with innovative training, strategic planning, and new program development. In addition, it is crucial to think about the instructional methods and teaching philosophies of online instructors. The next section of this report explores such pedagogical issues.

Note : See the Observatory's Monthly Report 'The Perfect Storm, Part 2' for Storm #3 and #4 and concluding remarks (published week of June 28, 2004).

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